34. (Amended) The heat exchanger of claim 1, wherein the heat exchanger can conform about a mandrel that has a diameter of at least about one centimeter (about 0.39 inches) without significantly constricting flow through the plurality of flow passages.

REMARKS

The above listed claim amendments along with the following remarks are fully responsive to the Office Action set forth above. Claims 1-25, 31-32 and 34 are pending. Claim 33 has been cancelled. Claims 32 and 34 have been amended.

Claim 31 was rejected by the Examiner because the term "microreplicated" was viewed as a method limitation in an apparatus claim. As used in the claim, the term "microreplicated" refers to the material used in fabricating the devices, not to the method of fabrication. A microreplicated material, as defined in the specification, refers to a manufactured structured surface where the structured surface features retain an individual feature fidelity during manufacture, from product to product, that varies no more than about 50 μm. See the specification, page 21 lines 13-18.

Claims 32 and 33 were rejected on the grounds that the terms "thermally conductive" and "flexible" are relative terms. Claim 33 has now been cancelled. Claim 32 has been amended to clarify that, for a preferred embodiment, the cover layer can be made from a material possessing greater thermal conductivity than the material from which the first layer containing the structured surface is formed. Support for this clarification can be found in the specification at page 24, lines 6-9.

Claim 34 was rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 34 was rejected because, as written, it depended on a non-existent claim 35. This inadvertent error has been corrected by the present amendment, which modifies the claim so that it properly depends from independent claim 1.

Claims 1, 21 and 31-33 were rejected under 35 U.S.C. 103(a) as being unpatentable over Phillips, *et al.* (4,894,709). The Office Action asserts that Phillips, *et al.* discloses all the claimed limitations except the first layer being a polymeric film material, and that it would have been an obvious design choice to substitute polymeric material in place of the semiconductor or metallic materials disclosed in Phillips, *et al.*

In making that assertion, the Examiner relies on *In re Leshin*, 277 F.2d 197. On the basis of *Leshin*, the Examiner argues that it is within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use, thus making the choice obvious. However, this is an overly broad reading of the decision in *Leshin*.

In *Leshin*, the applicant's claims 14 and 15 were directed to a cosmetics dispenser formed from plastic. The prior art taught a similar dispenser, also made from a plastic. The applicant argued that, although the plastics he used were well-known, he had to select a specific plastic that was most suitable for his particular purpose, and therefore the choice was non-obvious. Judge Rich of the CCPA rejected this argument outright, stating that

> Mere selection of known plastics to make a container-dispenser of a type *made of plastics prior to the invention*, the selection of the plastics being on the basis of suitability for the intended use, would be entirely obvious; and in view of 35 U.S.C. 103 it is a wonder that the point is even mentioned.

Id. at 199 (emphasis added).

As indicated in the portion of the decision quoted above, a key fact in that case was that the prior art taught devices that were fabricated *from plastic* and were similar to the applicant's. Leshin then merely chose *another plastic* for his device, and limited his claims to the plastic that was most suitable for his particular purpose. It was obvious, in the eyes of the CCPA, for Leshin to choose a different plastic, when it was already known that the devices could be made from plastic.

It would be a broad reading, however, to say that it would have been obvious for Leshin to choose *any* material that was suitable for his particular purpose. The *Leshin* decision merely states that it was obvious to choose the most suitable *plastic* from the class of known plastics, when it is *already* taught in the prior art that the device can be formed from plastics. There is *no indication* from the facts or the wording of the case that it would be obvious to choose another *type* of material altogether, just because the chosen material is suitable for the intended purpose.

The *Leshin* case is inapposite to the present application. What is claimed in the present application is microchannel heat-exchanging devices comprising polymeric film material as a first layer. Neither the Phillips, *et al.* reference nor any of the others cited by the Examiner discloses a first layer of polymeric film material. The devices of Phillips, *et al.* are made from silicon substrates and are formed by precision sawing or etching. The only classes of materials suggested by Phillips, *et al.* are semiconductor substrates such as silicon, germanium or gallium arsenide, or metallic substrates such as copper or silver. (Col. 11, lines 58-61).

In view of *Leshin*, what is obvious from Phillips, *et al.* would be for one skilled in the art to make a heat sink out of germanium or another hard semiconductor or metallic substrate, where the choice is motivated by the particular purpose envisioned by the skilled worker. For example, if the worker required a different band gap than silicon would provide, he might choose gallium arsenide for fabricating the devices of Phillips, *et al.*, and the choice would be obvious in light of *Leshin*.

It is not obvious, however, to fabricate structures from a different class of materials altogether, simply because the choice is informed by the particular application envisioned by the inventor. The Applicants have fabricated microchannel heat-exchanging devices using a polymer film layer, which confers benefits for the resulting device, such as flexibility in some embodiments. It is improper to look in hindsight and deem the invention obvious, simply because flexibility might be expected from a device made using polymer film material. The invention must be considered *as a whole* and compared to the prior art.

The Phillips, *et al.* reference teaches only that relatively hard substances can be used, such as semiconductors or metals, and that sawing or etching would be the methods most likely used for fabrication of the devices. The Applicants have demonstrated that alternative methods can be used to fabricate a structure that is entirely different from the ones disclosed in Phillips, *et al.* The Applicants' structure is not within the contemplation of the materials or processes taught or suggested in Phillips, *et al.* Therefore, the Applicants' invention is not obvious in light of Phillips, *et al.*, and the Applicants respectfully requests withdrawal of the rejection.

Claims 1, 21-23 and 31-33 were rejected under 35 U.S.C. 103(a) as being unpatentable over Bae (5,771,964). As the Examiner has recognized, Bae does not teach the use of polymeric film material for the first layer. The Office Action asserts that Bae discloses all the claimed limitations except the first layer being a polymeric film material, and that it would have been an obvious design choice to substitute polymeric material in place of the materials disclosed in Bae.

The Bae reference discloses a heat exchanger comprising conduit tubes with serpentine fins running between the tubes. The only materials contemplated for fabrication of the Bae devices are aluminum and copper (Col. 4, lines 50-51 and 60), metals with superior thermal conductivity. The Bae structure is made rigid by brazing the serpentine fins to the conduit tubes (Col. 4, lines 58-59). There is no suggestion or motivation in the Bae reference that a microchannel device could be formed from polymeric film material. Likewise, there is no suggestion that a flexible heat exchanger could be made from *any* material using the design of Bae.

In making the rejection, the Examiner has again relied upon the *Leshin* case. For the same reasons as given above, the *Leshin* case cannot be read to mean that any choice of material is obvious when the choice is made with a particular purpose in mind. *Leshin* stands only for the proposition that it is obvious to choose another material from a known class of materials that has been used to fabricate a structure, where the choice is motivated by the suitability for the intended use.

Under the rationale of the *Leshin* case, it would be obvious, for example, to fabricate the device of Bae from titanium, another metal with high thermal conductivity, if one desires to reduce the weight or increase the strength of the device. It is not obvious, however, to fabricate a similar structure from an *entirely different* class of material, such as polymers. Thus, the Applicants' claimed devices are not rendered obvious by the Bae reference, and Applicants respectfully requests withdrawal of the rejection and allowance of the claims.

Claims 1-5, 9-10, 12-23 and 31-33 were rejected under 35 U.S.C. 103(a) as being unpatentable over Rosman, *et al.* (4,347,896) in view of Bae. The Office Action asserts that Rosman, *et al.* discloses all the claimed limitations except for polymer film material and the hydraulic radius and channel length of the channel structures. The missing limitations on the hydraulic radius and channel length are provided by the Bae reference, according to the Office Action.

The Rosman, *et al.* reference teaches a channeled plate with an internal manifold. The plates can be stacked to form a heat exchanger. As the Examiner has noted, Rosman, *et al.* discloses that the plates could be formed from polymer material (Col. 8, lines 41-46). The Examiner states that one of ordinary skill in the art would employ the teachings of Bae to achieve optimal heat exchange in the device of Rosman, *et al.*

However, the Rosman, *et al.* reference does not provide the motivation to make its devices from polymeric *films*. The Rosman, *et al.* reference teaches that the plates are made using a die (Col. 2, lines 40-41) and that the stack of plates is assembled by diffusion bonding, brazing, welding or bolt-clamping a plurality of plates (Col. 2, lines 51-54). None of these methods of manufacture would be compatible with the concept of forming the stacked-plate device from polymeric film material. The Rosman, *et al.* disclosure does not enable or teach one skilled in the art that the device's features can be made on a much smaller scale (i.e., the scales disclosed in Bae) using a polymeric film. Rather, the Rosman, *et al.* reference might motivate one to make a heat exchanger from a rigid plastic in the same

dimensional scale as its devices. It suggests using a die to form plates from a rigid polymer, which could then be bonded or clamped together to form a bulky heat exchanger.

Thus the Rosman, *et al.* reference does not suggest to a reasonable likelihood of success that a microchanneled polymeric film structure could be similarly made for use as a heat exchanger. Nor does the Bae reference provide motivation for using polymeric film material, as discussed above, and so the missing limitations in Rosman, *et al.* are not completely provided by Bae. The Bae reference also neither teaches or enables the skilled artisan to make microchanneled devices from polymer material.

Furthermore, it is improper to take the motivation for a suggested combination from the nature of the problem to be solved; see *In re Zurko*, 111 F.3d 887. Therefore, one cannot conclude that the skilled artisan would combine the teachings of Rosman, *et al.* and Bae when the artisan is focused on the objective of forming a heat-exchanging device from polymeric film material. Neither reference suggests that a heat exchanger could be made from polymeric film material. Neither suggests that a flexible heat exchanger could be made from any class of material, unlike certain embodiments of the Applicants' invention. Unless the specific problem that is the inventor's focus is identified in the prior art, the missing limitations cannot be inferred from the nature of the problem to be solved. Id. at 890. To do so is to use impermissible hindsight to arrive at the claimed invention. Id. at 889.

The Examiner argues that one of ordinary skill in the art would employ the teachings of Bae to achieve optimal heat exchange in the devices of Rosman, *et al.*; however, there is no indication in either reference that heat exchange can be *optimized* by utilizing a polymeric material. In order for a combination to be proper, the prior art must suggest the desirability of making the combination. *In re Rouffet*, 149 F.3d 1350. The art cited by the Examiner gives no indication that there would be any desirable benefit that could be obtained by the combination. Rather, one skilled in the art would in fact recognize that better thermal conductivity is generally obtained using a metallic structure, as indicated by both the Rosman, *et al.* and Bae references. On the other hand, many polymers are poor thermal conductors. One skilled in the art would most likely not choose a polymeric material, if he

desired to optimize heat exchange. Although the Rosman, *et al.* reference states that polymer material could be used, it does not indicate the desirability of using polymeric films. As there is no motivation for combining the references, the proposed Rosman, *et al.* combination with Bae cannot render the Applicants' invention obvious.

Claims 14 and 24 were rejected under 35 U.S.C. 103(a) as being unpatentable over Rosman, *et al.* in view of Bae and Schubert *et al.* (4,347,896). As discussed above, the Applicants' invention is not obvious in view of the combination of Rosman, *et al.* and Bae. As claims 14 and 24 depend on patentable claims and contain further limitations, they too are allowable. Applicants respectfully requests withdrawal of the rejection and allowance of the claims.

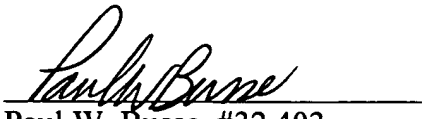
CONCLUSION

All pending claims are now in condition for allowance. A notice to that effect is respectfully requested.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with markings to show changes made."

Respectfully Submitted,

THOMAS I. INSLEY et al.

By: 

Paul W. Busse, #32,403
FAEGRE & BENSON LLP
2200 Wells Fargo Center
90 South Seventh Street
Minneapolis, MN 55402-3901
612/766-7046

Dated: October 1, 2001

Serial No.: 09/099,632

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

32. (Amended) The heat exchanger of claim 1, wherein the first cover layer ~~comprises a thermally conductive layer~~ has greater thermal conductivity than the polymeric film material of the first layer.

~~33. (Cancelled) The heat exchanger of claim 1, wherein the heat exchanger is flexible.~~

34. (Amended) The heat exchanger of claim ~~35~~ 1, wherein the ~~flexible~~ heat exchanger can conform about a mandrel that has a diameter of at least about one centimeter (about 0.39 inches) without significantly constricting flow through the plurality of flow passages.